

### **REMARKS**

Claims 1-10 are pending in the present application, and stand finally rejected pursuant to an Office Action dated 4/19/2004. Reconsideration of these claims is respectfully requested, based on the following remarks.

#### **I. 35 U.S.C. § 102, Anticipation**

The Examiner rejected Claims 1-10 under 35 U.S.C. § 102 as being anticipated by Voigt et al. (US Pat. No. 5,960,451). This rejection is respectfully traversed.

Generally speaking, the claimed invention is directed to a new type of storage unit – a virtual data unit. The virtual data unit advantageously provides an abstraction layer above a logical device, as the virtual data units are mapped into logical device definitions, such logical device definitions defining logical devices as shown in Applicants' FIG 3 (where virtual device structures 304, 306 and 308 are shown being mapped by mapping function 310 into logical device definitions 312, 314 and 316). These logical device definitions define logical devices which are ultimately implemented in underlying physical hardware such as physical storage devices 322 shown in FIG. 3. Importantly, these virtual data units include associated management information such that the management information provides first and second boundaries. The first and second boundaries limit preferences in which to store the virtual data units within the stored data management system (Specification page 7, lines 11-16). Such management information may be independent of attributes of, or characteristics of, the devices in the physical storage subsystem that are actually used to store the data elements (Specification page 13, lines 16-19) and the next level logical devices or LUNs (Specification page 16, lines 7-24; Claim 2), thereby providing an ability to flexibly define data storage requirements at the data level (virtual data unit) as opposed to the device level (physical or logical device) (Specification page 17, line 24 – page 18, line 13). Thus, the present invention advantageously provides an ability to anticipate future requirements by matching the definition associated with a virtual data unit to a logical device definition with expanded capabilities (Specification page 18, lines 14-17). For example, the characteristics of a virtual data unit may be historically maintained in a meta-data record associated with that data unit and may be updated as the use of data is monitored. Updates may then trigger

subsystem activity to modify the stored characteristics for the data unit (Specification page 20, lines 5-10; Claims 7-10). As another representative advantage provided by the claimed invention, new specifications for data storage characteristics can be made after the data unit has been stored. The ability for modifying where and/or how an already stored data unit is managed provides an ability, for example, to actually change where and/or how the data elements are stored, which may be required to meet newly interpreted or specified data unit storage characteristics (Specification page 20, lines 15-23). These are but a few representative examples of advantages provided by having a virtual storage unit and associated management information that is mapped into logical device definitions, which *provides an ability to flexibly define data storage requirements at the data level as opposed to the device level*. In contrast, the teachings of the cited Voigt reference are directed to specifying storage characteristics at the device level.

Specifically with respect to Claim 1, such claim recites “a plurality of virtual data units functionally coupled to the one or more hosts, wherein the plurality of virtual data units includes associated management information such that the management information provides first and second boundaries such that the first and second boundaries limit preferences in which to map the virtual data units into logical device definitions within the stored data management subsystem” (emphasis added by Applicant). The cited Voigt reference does not teach this claimed (underlined) feature. In rejecting Claim 1, the Examiner equates (i) the claimed virtual data units with Voigt’s logical storage units (LUNs); (ii) the claimed associated management information with Voigt’s parameters/preferences such as physical capacity, number of storage disks, allocated capacity, characteristics of the RAID, percentage to be used, performance and availability; and (iii) the claimed logical device definitions correspond to LUN types, sizes and identification numbers. The Examiner also notes that Voigt teaches maps within administrative module that relate the various views of storage.

Thus, the following depicts the Examiner’s reading of Voigt’s teachings as compared with the claimed terminology of Claim 1:

Claimed ElementVoight Element

virtual data unit

logical storage unit (LUN)

associated management information

LUN parameters/preferences

logical device definitions

LUN types/sizes/ID numbers

Applicants show that per this interpretation of Voight, and when substituting these Voight elements into Claim 1, it would read (with the substituted terminology being italicized for ease of reference):

a plurality of *logical storage units (LUNS)* functionally coupled to the one or more hosts, wherein the plurality of *logical storage units (LUNS)* includes associated *LUN parameters/preferences* such that the *LUN parameters/preferences* provides first and second boundaries such that the first and second boundaries limit preferences in which to map the *logical storage units (LUNS)* into *LUN types/sizes/ID numbers* within the stored data management subsystem

This substitution of Voight's elements into Claim 1 shows clear error in the Examiner's reading/interpretation of the Voight reference. In particular, the resulting phrase "map the logical storage units (LUNs) into LUN types/sizes/ID numbers" makes no sense, as there is no mapping of an existing LUN into a LUN type. Instead, a LUN as taught by Voigt is a particular instance of a LUN type. For example, Voight teaches providing a LUN that implements or is an instance of a RAID 5 storage device. Voight's logical unit device (LUN) is not subsequently mapped into another logical device (such as a LUN type), but rather is the final resulting logical device. While this final logical unit device may ultimately be mapped into physical storage, that is not what is alleged by the Examiner or what is claimed by Applicants. Rather, what is claimed is that an abstraction layer *above* the logical unit device device (LUN) is provided, and specifically a virtual data unit that is mapped into logical device definitions. This virtual data unit has

associated management information such that the management information provides first and second boundaries. The first and second boundaries limit preferences in which to map the virtual data units into logical data definitions within the stored data management system. Because the virtual data units are *mapped into* logical data definitions, they are 'above' or 'precede' the logical devices in a data hierarchy, as shown in Applicants FIG. 3. Voight's LUNs are not subsequently mapped into a logical definition or device. Thus, per the Examiner's interpretation of Voight's LUN as reading on the claimed virtual data unit, it is shown that there is no teaching of mapping this Voight LUN into logical device definitions, as claimed.

While Voigt also makes mention of a storage hierarchy in which application-level virtual storage space is provided, in order to present to the user a contiguously addressable storage space (and hide the physical and RAID-level views from the user), this application-level virtual storage space/view does not have associated management information such that the management information provides first and second boundaries such that the first and second boundaries limit preferences in which to map the virtual data units into logical device definitions. Thus, even when interpreting Voight's 'upper-level' or 'application-level' view as being the claimed virtual data units, there is no management information associated with this application-level view that provides first and second boundaries such that the first and second boundaries limit preferences in which to map this Voight application-level view to Voight's logical units or LUNs.

Thus, it is shown that Claim 1 has been erroneously rejected under 35 U.S.C. 102 as every element of the claimed invention is not identically shown in a single reference<sup>1</sup>.

Applicants initially traverse the rejection of Claims 2-10 for reasons given above regarding Claim 1, of which Claims 2-10 depend upon.

Applicants further traverse the rejection of Claim 2 by showing that the cited reference does not teach the claimed feature of "wherein the management information is independent of attributes of the virtual stored data management subsystem". The Examiner has equated Voight's teachings regarding LUN parameters/preferences as

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<sup>1</sup> For a prior art reference to anticipate in terms of 35 U.S.C. 102, every element of the claimed invention must be identically shown in a single reference. *In re Bond*, 910 F.2d 831, 15 USPQ2d 1566 (Fed. Cir. 1990).

reading on the claimed management information, such as characteristics of the RAID, including performance and availability. It is shown that this further highlights how the claimed invention differs from the teachings of Voight, as the claimed virtual data units are an abstraction layer different from, and therefore having an ability of having different attributes from, the underlying logical or RAID device. Voight's RAID characteristics are shown to not be independent of the RAID device, as they *directly specify the type of* RAID device such as RAID 1 or RAID 5. Thus, it is not reasonable to interpret Voight's teaching of RAID characteristics such as RAID type as being independent of the resulting RAID logical device as taught by Voight. Thus, Claim 2 is further shown to have been erroneously rejected by the Examiner, as Voight's parameters/preferences are not independent of attributes of the virtual stored data management subsystem.

Further with respect to Claim 7 (and dependent Claims 8-10), Applicants show that the cited reference does not teach the claimed feature of "wherein the management information is processed in accordance with storage element attributes and further comprises: deriving relationships that define the first and second boundaries; and stipulating the first and second boundaries, *wherein stipulated first and second boundaries includes stated relationships from derived relationships*" (emphasis added by Applicants). This claimed feature of Claim 7 advantageously provides the ability to monitor and if needed, to modify or adjust data storage characteristics after the virtual data element has already been stored (see Specification page 14, lines 1-15; page 19, lines 1-27, for example), by deriving relationships that define the first and second boundaries which are used to limit preferences when mapping from the virtual data units into logical device definitions. This further emphasizes highlights of the present invention in providing a data abstraction layer (a virtual data unit) with associated management information at a level which is then mapped into logical definitions such as logical units or LUNs. This claimed feature of Claim 7 is not taught by the cited reference, nor has the Examiner alleged any such teaching. Thus, it is shown that Claim 7 (and dependent Claims 8-10) has been erroneously rejected, as every element of the claimed invention is not identically shown in a single reference.

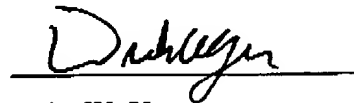
Therefore, the rejection of Claims 1-10 under 35 U.S.C. § 102 has been overcome.

**II. Conclusion**

It is respectfully urged that the subject application is patentable over the cited reference and is now in condition for allowance. The Examiner is invited to call the undersigned at the below-listed telephone number if in the opinion of the examiner such a telephone conference would expedite or aid the prosecution and examination of this application.

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Respectfully submitted,



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